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# SCIENCE

NEW YORK, DECEMBER 2, 1892.

## IMMUNITY FROM LEPROSY OF THE FIFTH GENERATION.

BY ALBERT S. ASHMEAD, M.D., NEW YORK.

THERE is a fact which, I believe, bears very directly and very strongly upon the subject of non-contagion of leprosy. It is recognized by all Oriental leprologists that every child of a leper has an inheritance of the disease, but diminished, and that after the fourth generation, if no healthy blood intervenes, the disease is entirely extinguished. There is about these matters a very interesting law in China, and consequently in Japan, the latter being, in spite of its western civilization endeavors, much more submissive to Chinese traditions than to European ideas. I find it expressed in Virchow's Archives by Dr. Friedel, in the following words:—

"No marriage with children of leprous parents is allowed. If leprosy appears in a family formerly clean, all betrothals and contracts of marriage previously entered into are rescinded as a matter of course. Only when the betrothed or married persons suffer of the same degree and type of leprosy, for instance, if they are both of the fourth degree of generation, the alliance stands. Only equal degrees of age of the morbid cases are allowed to connect themselves by marriage. A leper of the fourth generation, even if he no longer shows any external marks of the disease, can only marry a woman of the same degree of age of the disease: their offspring is free from leprosy, and no longer forbidden human intercourse."

Here we have, then, a perfect immunity acquired in four generations, and the fifth generation restores the health of the race. There is certainly a connection between this extinction of the disease and the present immunity of Europe, after that part of the world had been a prey to leprosy during several centuries of the middle ages. Evidently in the west, simple isolation has unconsciously accomplished in the lapse of time what a rational legislation tries to bring about in the east. This legislation has probably preserved the populations of China and of the east in general from entire destruction. I do not mean to say that the rule is always and carefully adhered to, because in that case the disease would be extinct now; but the rule is sufficiently known, and sufficiently adhered to, to make its salutary consequences felt.

Isolation then, and exhaustion of the pathological principle, after the course of four generations, are the only methods known to us of acquiring immunity. Wherever the disease still exists, it is the violation of that law, with which all the Oriental priests and doctors are so familiar, that has kept it alive. I had occasion about a year ago to speak of these matters, at a time when there was very much and very silly newspaper talk about the danger arising from the presence of a few poor leprous Chinamen in New York. I beg permission to reproduce here my whole article which I sent at that time to the *Tribune*, and which was published Aug. 9, 1891.

"The recent appearance of several Chinese lepers in New York, and the fact that they are permitted to pursue their avocation for a time, at least, among us, suggests to me the following points which it may be useful to consider in our conduct towards individuals of that kind, which the abundant flow of immigration may bring to our shores:

"1. Leprosy in China is very frequent; in the province of Quang-tung, of which Canton is the capital, alone, there are at least 10,000 lepers; in all the maritime provinces of the South it rages with the greatest intensity. It abounds, also, in Hankow, Central China. Outside of Canton, in its province, there are many

leper villages, also along the Yang-tse-Kiang, as has been noted by several European observers. As to the interior of China, our knowledge of leprosy, of course, is derived solely from indigenous information. We know that the disease is more frequent in Quang-tung, Quang-sae, Hoonan, and Fuh-kun. In Pekin leprosy is rare. It is a generally admitted fact that it has not spread beyond the regions where it is established. Of course, it should be a rule at San Francisco to obtain information as to the part of China where the Mongolian immigrant comes from, if such a thing is possible. At any rate, might not a certificate of health be required of him?

"2. The Chinese believe that the disease may be communicated by the contamination of food. This generally received opinion must seem to us strange at first; but the fact that the leprobacillus is found in greater abundance in the mucous membranes about the mouth, throat, and nose lends it a certain degree of plausibility. Now, the Chinese established among us preserve, as everybody knows, all the customs of their own country. One of these customs consists in grouping together and eating their rice from the same bowl with those chopsticks which are promiscuously used by the whole house. If there is really something in the Chinese views of food infection, the necessity of isolating a leper from his countrymen is evident.

"3. The Chinese Government believes that leprosy is contagious, but it does not seem as if the people shared in this belief. There are asylums to isolate lepers all around Canton; laws and regulations have been issued with the same views. Yet, in spite of the regulations, the leper may enter any city by paying a certain sum of money, which goes to the leper fund. Altogether the Chinese act as if they did not believe in contagion. Nobody thinks of refusing to buy from a leprous huckster; provisions are bought fearlessly in the store of a leprous caterer. The disease, we may therefore admit, cannot easily be communicated by contact. Yet if there is any danger in contact, then we may be sure that the Chinese among us, true to their traditional customs, as they are, will do nothing to diminish it.

"4. But even the Chinese believe, with many other Eastern nations, that leprosy is communicated by cohabitation. Their laws recognize this fact. Some strange superstitions show how much the people are convinced of it. It is a belief among the leprous women of China that a woman affected with leprosy can be cured by cohabitation with healthy males. Whether we admit the Chinese theory, or are inclined to doubt it, we cannot absolutely condemn it, and therefore should not legal obstacles be put in the way of such intercourse between the two races? At any rate a leprous Chinese should under all circumstances be sent back to his own country.

"5. To allow the leprous male intercourse with healthy women is simply to strengthen and nourish the lepro-bacillus. The strength of the latter is gradually attenuated as lepers breed with other lepers, so that after a certain number of generations the obligate parasite is extinguished. This is the law of hereditary transmissibility, which has influenced all Oriental legislation, inasmuch as marriage between recognized lepers is permitted, while between a leper and a healthy person it is prohibited. This tendency to further disease, produced by the admixture of healthy elements, may not be apparent at the first forthcoming generation. The disease sometimes skips a generation or two and remains latent, until the third or fourth, perhaps, it meets with susceptible material. As long as there is a leper here, unrestrained in his actions, there is evidently danger of his perpetuating the disease among us.

"6. It must not be believed that we are absolutely and under all circumstances safe from leprosy. It is true that European residents in China, even where their contact with the natives is very close, catch the disease only when they un-Europeanize themselves altogether, that is, eat and live with the natives on

the most intimate terms. But then, under these circumstances, they catch the disease. As there is no danger here of such identification of the two races, we need no protection from a board of health for our own persons; but if some restraint is not put upon the intercourse of the races future generations, even here, may have to pay for the imprudence of their fathers. It seems to me that it is the duty of our National Board of Health to send back to their own country the lepers who have it now in their power to poison several generations and to establish a horrible disease, to be exempted from which we have considered hitherto a precious privilege, and thanked God for it."

It follows from all that I have said that the danger from leprosy does not arise from any contagious action, but from the continual reintegration of the disease, which results from the intercourse of lepers with healthy individuals. Contrary-wise to what would happen in syphilis, this intercourse strengthens and perpetuates the evil. As a matter of fact, no greater difference can be imagined in the etiology of two diseases than that which exists between leprosy and syphilis. I may here call the attention of all dermatologists to the well-known Colles law. According to that law, a woman who bears a child to a syphilitic man acquires perfect immunity from syphilis. Now, nobody doubts, either in China or Japan, that a leprous woman bearing a child to a healthy father acquires some measure of immunity; while the child receives and transmits the susceptibility. This is a fact diametrically opposed to those which are included in Colles law.

An assimilation, in whatever degree of leprosy and syphilis, has been made by many otherwise acute observers. Yet, what a difference in regard to contagiousness; for instance, there is in the fact that one disease, breaking out at the age of puberty, spares the race, while the other congenital, appearing with the appearance of the individual himself (both parents being supposed to be syphilitic) would destroy the race. In leprosy the intervention of pure blood acts as a nourishment to the disease; in syphilis, it attenuates the virus. The attenuation of germs, when they are allowed their regular course, seems to me to be of more general application. It is believed in Japan, that a child of parents who enjoy immunity from small-pox, by having had the disease, possesses itself a natural immunity (not a perfect immunity) transmitted to it. This was the greatest obstacle to the introduction of vaccination into Japan: artificial immunity of the parents, they said, would interfere with the natural power of resistance of the child. Variolization (if I may coin the word) and syphilization were always popular in Japan, in consequence of these same traditions. The complete devitalization of our introduced vaccine virus, after a certain series of inoculations, when a new virus had to be imported, proves that these Orientals were right. The devitalization of the germ of syphilis, which has occurred in Japan, after thirteen centuries of syphilitic inoculation, proves also that a natural immunity is acquired by the very transmission of the disease.

Let me say now what I believe must be rationally deduced from all I have said: What is generally called contagiousness does not essentially belong to the disease itself, it is entirely in the individual who contracts it. Its measure is that of the resistance of the individual or of the race. In four generations of lepers, regulated as I have said, the power of resistance becomes complete. In an unconscious, blundering, mediæval way, the resistance has been acquired by Europe. There is no place for the idea of contagion in these facts.

#### THE INFLUENCE OF THE MOON ON RAINFALL— A SYMPOSIUM.

I.— BY MANSFIELD MERRIMAN, PH.D., LEHIGH UNIVERSITY, SOUTH BETHLEHEM, PA.

THE widespread notion regarding the influence of the moon on the weather has probably some slight validity. The dispersion of clouds in mountainous regions under the influence of a full moon has been noted by several observers, as also the peculiar movement of thunder-storms. Yet little evidence, except of a negative character, has been derived by a discussion of rainfall statistics, although the rainfall is an element probably quite as

liable to be influenced by the moon's changes as other elements. A series of observations, suitable in all respects for such discussion, is indeed difficult to find. The mean daily rainfall for a locality of wide area is not adapted to this purpose, for the moon's influence cannot be supposed to be the same under different topographical conditions. Even the daily records of rainfall at a single station may not be good ones if changes occur from time to time in surrounding buildings and trees, or if the gauge is placed at different positions in different years.

The observations of rainfall, taken at Bethlehem, Pa., by Mr. F. E. Luckenbach, during 1881–1890, are selected as the basis of a brief discussion, and they are believed to be free from the objections above noted. The amount of rainfall in each year was obtained for the day of new moon and for each of the three days preceding and following, and also for the other quarters. For each year a curve of rainfall throughout a lunar month of 28 days could then be drawn, and these curves were combined in various ways to endeavor to ascertain the features common to all of them. The following conclusions were derived: First, the new moon is liable to be followed by an increase in rainfall; second, the full moon is liable to be followed by a decrease in rainfall; third, the wettest period is generally at and preceding the full moon; and, fourth, the driest period is generally at and preceding the first quarter. These conclusions are, in general, most plainly marked in the years of least rainfall.

The first conclusion, that the rainfall is liable to increase after new moon, is perhaps the one most prominently observed in the curves for all the years. The frequency of rain, as shown by the number of days on which rainfall occurred, was also found to follow the same law. In the following table are given for each of the years the amount of rainfall on the two days before and on the two days after the day of new moon, as also the number of rainy days for each period. The number of new moons embraced in the table is 124, and in the last two columns are shown the number of times that this first conclusion was verified and the number of times that the opposite fact occurred. It is seen that every year except 1889 agrees with the conclusion as exhibited in the

*Rainfall for Two Days before and Two Days after New Moon.*

Year.	Inches of Rainfall.		Number of Rainy Days.		Conclusion Verified.	
	Before.	After.	Before	After.	Yes.	No.
1881	0.23	3.69	2	5	5	1
1882	1.51	2.24	2	4	3	2
1883	3.07	3.14	7	8	4	4
1884	1.28	4.66	5	6	6	5
1885	1.23	2.03	7	7	4	4
1886	2.88	3.03	5	10	7	3
1887	3.07	4.75	7	11	6	3
1888	1.58	1.68	5	8	6	3
1889	6.13	1.87	7	8	4	7
1890	3.05	6.91	6	7	6	2
1881–1890	23.97	33.87	53	74	51	34
Odd years	13.72	15.41	30	39	23	19
Even years	10.25	18.46	23	35	28	15
1881–1885	7.31	16.79	23	30	22	16
1886–1890	16.66	17.08	30	44	29	18

totals. The year 1889 was the one of heaviest rainfall, 57.68 inches, while 1881 had the least rainfall, 34.99 inches, the mean for the ten years being 45.68 inches. The probabilities of the respective occurrences, if based upon the totals for the ten years, are, hence,  $\frac{51}{124}$  that rainfall will increase after the new moon,  $\frac{34}{124}$  that it will decrease, and  $\frac{39}{124}$  that rain will not occur either in the two days before or in the two days after.